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Revision of the Termitophilous Tribe Philotermitini (Coleoptera: Staphylinidae)

I. The Genus *Neophilotermes* Seevers and Its Host Relationships¹

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ABSTRACT

The genus *Neophilotermes* Seevers is redescribed and illustrated. The one previously known species, *N. laxicornis* Sharp, is redescribed. Three new species are described; *N. costaricensis* from Costa Rica, *N. dybasi* from Panama, and *N. mcmahanae* from Venezuela. Host data are given for all of the new species. Larvae associated with *N. dybasi* and *N. mcmahanae* are illustrated in the hope that they will help to unravel the life histories later. The host relationships of the species are discussed and while they are presently shown as host specific it is believed that they are termite predators and not highly integrated into the social life of the termites. The host relationships of all the termitophiles associated with *Coptotermes* around the world are briefly discussed.

ACKNOWLEDGMENTS

I wish to thank Dr. Elizabeth McMahan, Department of Zoology, University of North Carolina, Chapel Hill, and Mr. Henry S. Dybas, Field Museum of Natural History (FMNH), Chicago, for providing the new collections which formed most of the basis for this paper. Thanks are also given to Mr. Dybas and Dr. Rupert L. Wenzel for courtesies extended to me while studying the collections of Field Museum. Thanks are given to Mr. J. Balfour-Browne, Department of Entomology, British Museum (Natural

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History), (BMNH), London, for permission to study the collections of that museum. The initials given above will be used in the text to indicate the location of specimens cited. Specimens cited (DK) are in the collection of the author.

All of the host determinations in this paper were made by Professor Alfred E. Emerson, University of Chicago. These determinations are vital for a study like this and I am extremely grateful to him for taking the time to do them. I also thank Dr. Emerson for reading the manuscript of this paper and commenting on it.

I wish to thank the following Shinner Research Assistants, all of Chico State College, for help with various aspects of this study: James Clover, Margaret Enger, Lynette Hawver, Robert Palmer, Norris Sadler, and Karen Wells.

INTRODUCTION

It is the purpose of this paper to report three new species of the genus *Neophiloterme*s Seevers which have accumulated in this laboratory over the past few years. The presence of this new material permits a more detailed description of the generic characters and consequently the genus is herewith redescribed. One larva was found associated with the adults in each of two collections. It is frequently assumed that such associations will permit adults and larvae to be positively identified in the future and, in general, I believe this is true. However, I also believe that future workers need a faster way of knowing whether their new captures match old records than hunting through hundreds of vials in museum collections or these old associations will be largely ignored. I am accordingly providing photographs of the two larvae involved.

The tribe Philotermitini presently contains two genera: *Philoterme*s Kraatz and *Neophiloterme*s. These genera are easily distinguished by their very different tarsal formulas which is 4-4-5 in *Philoterme*s and 4-5-5 in *Neophiloterme*s. Also *Philoterme*s has a large amount of membranous development of the abdomen while *Neophiloterme*s does not. The two genera are very distantly related at best but will be left in the same tribe until more extensive studies of *Philoterme*s can be made.

The methods used for this study are given by Kistner (1968). All measurements are given in millimeters.

Neophilotermees Seevers

Neophilotermees Seevers, 1957, p. 257.

Most closely related to *Philotermees* from which it is easily distinguished by the presence of five segments in the tarsi of the mesothoracic legs, whereas *Philotermees* has but four segments in the tarsi of those legs.

Overall shape as in Figure 1A, B. Head capsule wider than long with the anterior edge of the epicranium and clypeus of normal size and shape. Capsule more or less oval in shape with large well-developed eyes with many laterally and anteriorly directed facets. Head not covered by the pronotum at the posterior border, without a neck, and with only a moderately impressed nuchal ridge. Antennae inserted between the eyes and the insertion of the anterior arms of the tentorium; 11-segmented, shaped as in Figure 2A. Gula short, with the sides relatively straight from anterior to posterior. Submentum broadly expanded anteriorly. Mentum distinct from the submentum, shaped as in Figure 2E. Man-

**A****B**

FIG. 1. Dorsal appearance of entire specimens: A, *Neophilotermees dybasi*; B, *N. mcMahanae*. Scale arbitrary, see description for measurements.

dibles asymmetrical, shaped as in Figures 2C, D; right mandible with a median tooth. Maxillae shaped as in Figure 2B; palpi 4-segmented. Maxillary acetabulae distinctly margined. Labium shaped as in Figure 2E; palpi 3-segmented. Labrum shaped as in Figure 2F.

Pronotum wider than long, shaped as in Figure 1, with the postero-lateral corners rounded so as to obscure the distinction between the lateral and the posterior borders. Posterior border of the pronotum evenly rounded. Prosternum short, with a carina medially located between the legs, with antero-lateral articulation processes of normal length. Mesothoracic peritremes membranous. Elytra without distinction, shaped as in Figure 2I. Wings present, of normal size, and with the usual staphylinid venation. Mesoternum short, about half the length of the metasternum. Mesocoxal acetabulae completely margined, mesocoxae contiguous. Mesosternal intercoxal process acute and carinate. Pro-, meso-, and metalegs shaped as in Figures 3A, B, and C, respectively. Note in particular that the tarsal formula is 4-5-5. Abdomen not physogastric, shaped as in Figure 1. Segment I represented only by the tergite fused to the metanotum. Segment II represented only by a tergite. Segments III-VII with 1 tergite, 1 sternite, and 2 pairs of paratergites each. Segment VIII represented by a sternite and tergite only. Dorsal margin of the abdomen occurs between the sternites and outer paratergites. Tergal defense gland reservoir of segment VI extremely large extending all the way to the anterior border of segment VI and with the sides extending fully to one-fourth the width from each lateral border of the tergite. The sclerotized egress points of this large tergal defense gland reservoir are shown in Figure 2G (see arrow). Segment IX trilobed, shaped as in Figure 2H, anterior apodemes of male not very conspicuous. Spermatheca sclerotized, shape variable by species. Median lobe of male genitalia large and bulbous, variable in shape by species. Lateral lobe of male genitalia shaped as in Figure 4D.

Type-species.—*Neophiloterme laxicornis* (Sharp).

KEY TO SPECIES

1. Build slender, shaped as in Figure 1A; yellow setae covering head, pronotum, and elytra short (0.03).....2
 Build robust, shaped as in Figure 1B; yellow setae covering head, pronotum, and elytra longer (0.05).....3
2. Macrochaetotaxy of abdominal tergites II-VIII as follows: 2,2,2,4,4,4,6
 *N. costaricensis*
 Macrochaetotaxy of abdominal tergites II-VIII as follows: 2,4,4,4,6,4-2,4-4
 *N. dybasi*
3. Macrochaetotaxy of abdominal tergites II-VIII as follows: 2,2,2,2,2,2,4
 *N. laxicornis*
 Macrochaetotaxy of abdominal tergites II-VIII as follows: 2,4,4,4,6,4,2-4
 *N. memahanae*

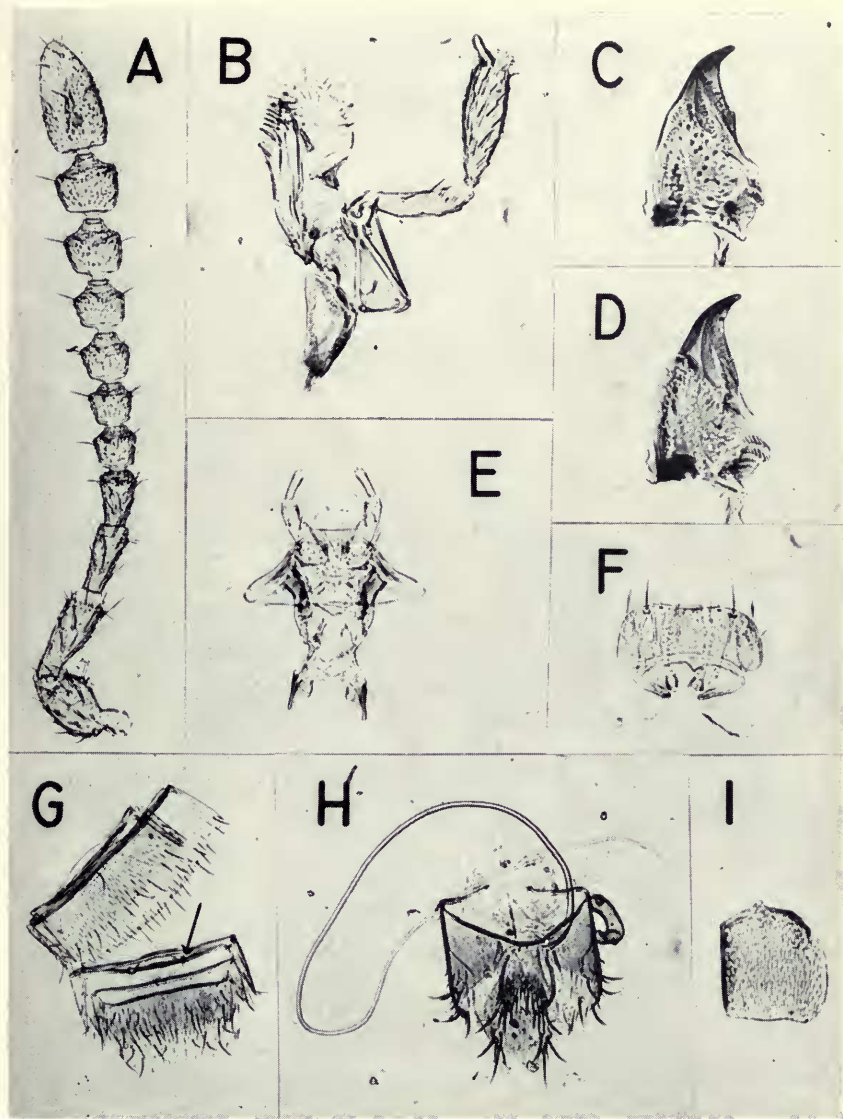


FIG. 2. *Neophiloterme dybasi*: A, Antenna. *N. mcmahanae*: B, Maxilla; C, Right mandible; D, Left mandible; E, Submentum and labium; F, Labrum; G, Abdominal segments VI and VII, arrow shows 1 opening of tergal gland; H, Abdominal segment IX and spermatheca; I, Elytron. Scale arbitrary, see description for measurements.

Neophiloterme costaricensis, n. sp. Figure 4C.

Neophiloterme laxicornis, Seevers, 1957, p. 257, fig. 37C, Costa Rica, Guapiles and Iberia Farm, Nevermann collection with *Coptotermes crassus* Snyder. [not *N. laxicornis* (Sharp)].

Most closely related to *N. dybasi* from which it is distinguished by the shape of the male genitalia and the chaetotaxy of the abdomen.

Color yellowish-brown throughout, head a little darker than the rest of the body; eyes silverish. Entire dorsal surface and ventral surface of beetle clothed with an even covering of fine yellow setae. These setae are relatively short (0.03) but are regularly placed over the entire surface. Macrochaetotaxy of abdominal tergites II–VIII as follows: 2,2,2,4,4,4,6. No other noticeable black setae present. Median lobe of male genitalia shaped as in Figure 4C. Spermatheca unknown.

Measurements.—Pronotum length, 0.36–0.38; elytra length, 0.24–0.27; head length, 0.27–0.29. Number measured, 3.

Holotype.—Male, no. 13687, Costa Rica, Guapiles, October 4, 1925, Coll. F. Nevermann. In the collection of Field Museum of Natural History.

Paratypes.—Costa Rica: 1, same data as holotype, (DK); 1, male, Iberia Farm (Hamburg Farm), June 26, 1925, Coll. F. Nevermann, (FMNH).

Notes.—The host termites of these specimens were determined to be *Coptotermes crassus* Snyder by A. E. Emerson. The only host specimens I know of are dry and attached to the specimens of the beetles.

Neophiloterme dybasi, n. sp. Figures 1A, 2A, 4B, 5A.

Most closely related to *N. costaricensis* from which it is distinguished by the shape of the male genitalia and the chaetotaxy of the abdomen.

Color light reddish-brown throughout, head and elytra somewhat darker than the rest of the body, eyes black. Dorsal surface of entire body with an even covering of fine yellow setae. These setae are relatively short (0.03). Lateral borders of pronotum with three very short black setae on each side. Macrochaetotaxy of abdominal tergites II–VIII as follows: 2,4,4,4,6,4–2,4–4. Median lobe of male genitalia shown as in Figure 4B. Spermatheca unknown.

Measurements.—Pronotum length, 0.37–0.39; head length, 0.25–0.28; elytra length, 0.33–0.35. Number measured, 4.

Holotype.—1, no. 13658, Panama, Canal Zone, Barro Colorado Island, January 28, 1959, Coll. H. S. Dybas. In the collection of Field Museum of Natural History.

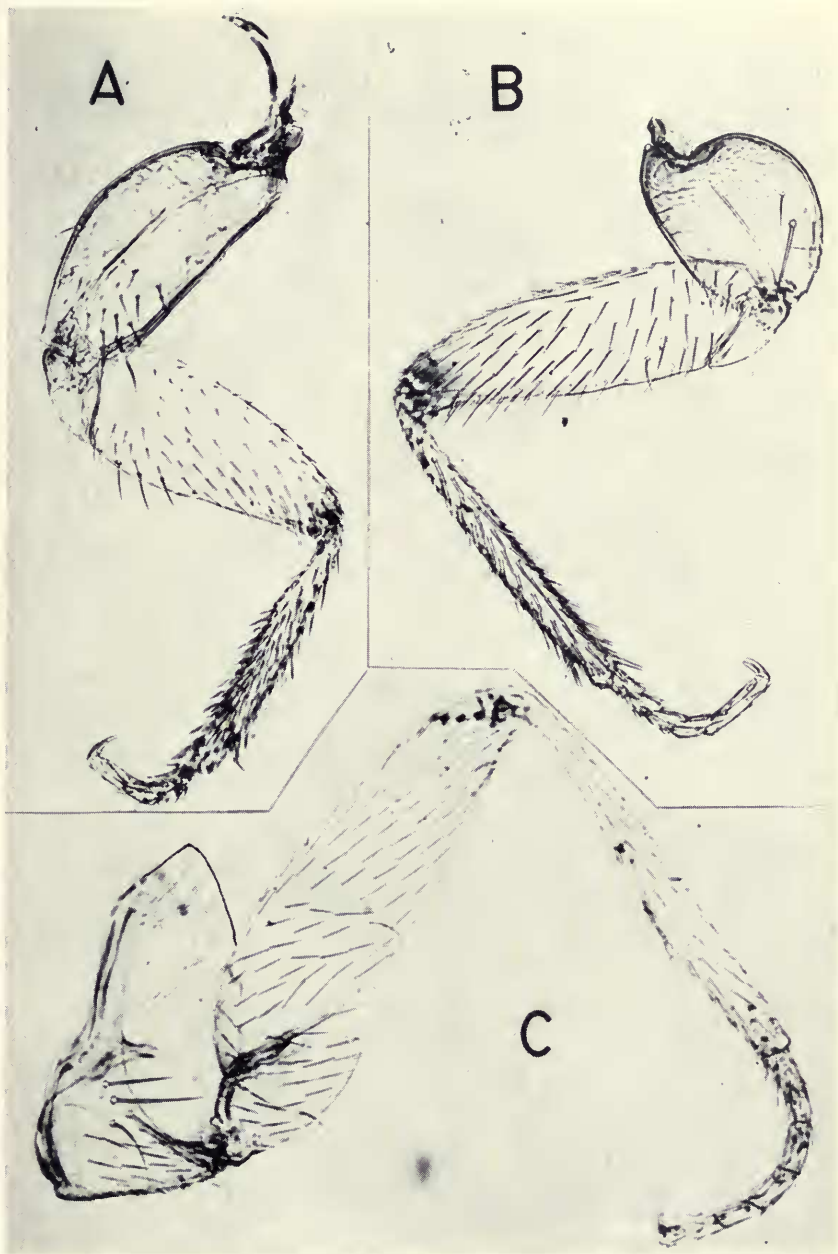


FIG. 3. *Neophilotermea mcMahanae*: A, Prothoracic leg; B, Mesothoracic leg; C, Metathoracic leg. Scale arbitrary, see description for measurements.

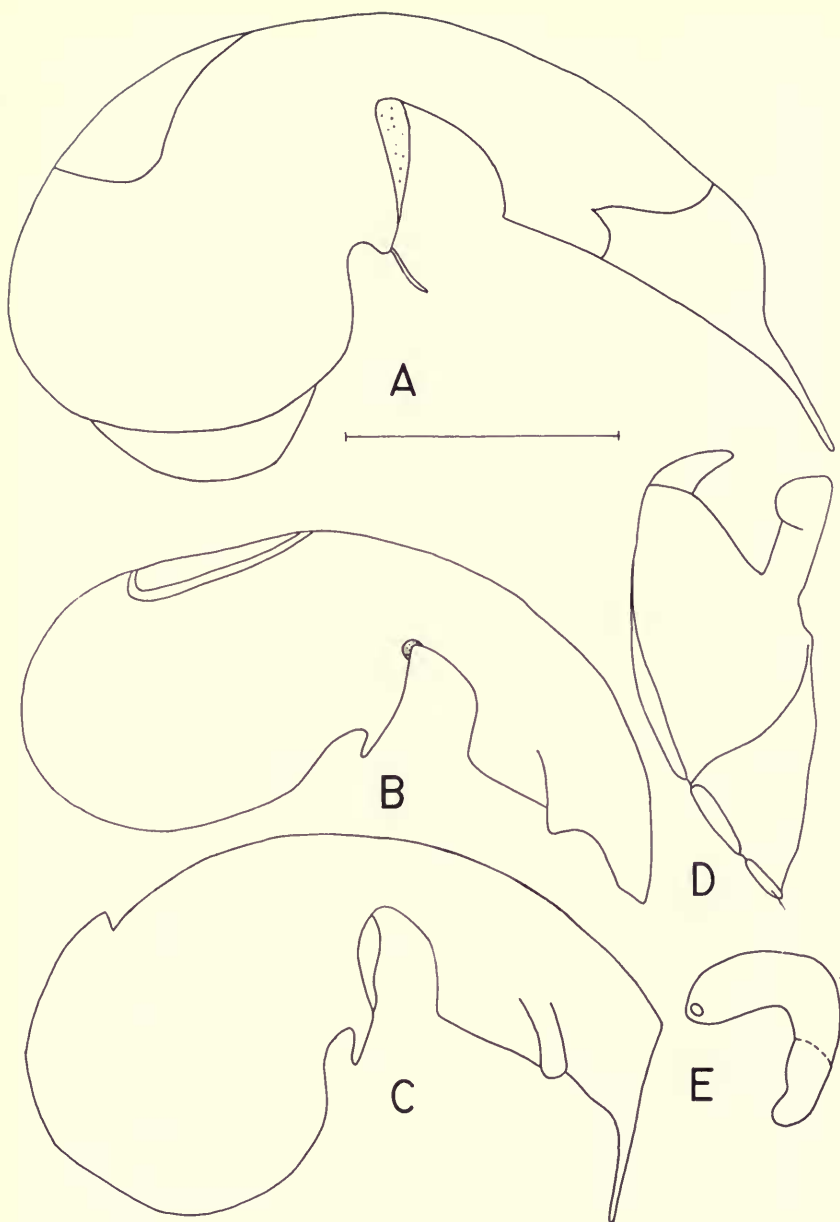


FIG. 4. Median lobes of male genitalia: A, *Neophiloterme memahanae*; B, *N. dybasi*; C, *N. costaricensis*. Lateral lobe of male genitalia: D, *N. memahanae*. Spermatheca: E, *N. laticornis*. Scale represents 0.25 mm. and applies to A-E.

Paratypes.—3, same data as holotype (FMNH, DK).

Notes.—The host termites were determined to be *Coptotermes niger* Snyder by A. E. Emerson. Specimens of the termites are in the Emerson Collection of the American Museum of Natural History, Field Museum of Natural History collection, and the collection of the author. The larva shown in Figure 5A was associated with the termitophiles in the galleries of the termites. It is problematical whether the larva is that of this species or not, but is offered in the hopes that future associations will help to establish part of the life history of the species.

***Neophilotermes laxicornis* (Sharp). Figure 4E.**

Philotermes laxicornis Sharp, 1883, p. 171, pl. 5, fig. 7, Guatemala, Las Mercedes, no host, British Museum of Natural History, London.

Neophilotermes laxicornis Seevers, 1957, p. 257 (changed generic name).

Most closely related to *N. mcmahanae*, from which it is distinguished by the shape of the spermatheca, its coloration, and the chaetotaxy of the abdomen.

Color uniformly reddish-brown throughout. Dorsal surface of the head, pronotum, and elytra covered with an even covering of fine yellow setae. These setae are relatively long (0.05). Macrochaetotaxy of abdominal tergites II–VIII as follows: 2,2,2,2,2,4. Sternites with an apical row of dark setae which are variable in number. Median lobe of male genitalia unknown. Spermatheca shaped as in Figure 4E.

Measurements.—Pronotum length, 0.40; head length, 0.30; elytra length, 0.35. Number measured, 1.

Material examined.—2, holotype and 1 specimen without type labels, Guatemala, Las Mercedes, 3,000 ft., Coll. Champion, (BMNH, FMNH).

Notes.—The host given by Seevers, *Coptotermes crassus*, no longer applies as the specimens forming the basis of the host name have been transferred to the species *N. costaricensis*.

***Neophilotermes mcmahanae*, n. sp. Figures 1B; 2B-I; 3; 4A; D; 5B.**

Most closely related to *Neophilotermes laxicornis* Sharp from which it is distinguished by its lighter color, the abdominal macrochaetotaxy, and the shape of the spermatheca.

Color light reddish-brown throughout, some specimens with the elytra somewhat darker than the rest of the body. Dorsal surface of body thickly clothed with an even covering of fine yellow setae. These yellow setae are relatively long (0.05). Lateral borders of the pronotum with 3 dark setae on each lateral border. These

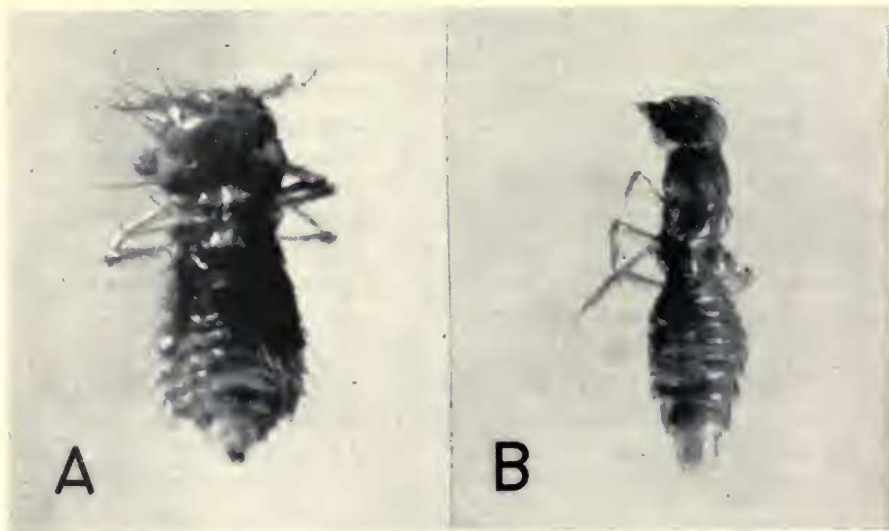


FIG. 5. Larvae associated with two *Neophiloterme* sp.: A, *N. dybasi*; B, *N. mcMahanae*.

setae are relatively short, but can be distinguished from the yellow setae which cover the entire pronotum. Macrochaetotaxy of abdominal tergites II–VIII as follows: 2,4,4,4,6,4,2–4. Median lobe of male genitalia shaped as in Fig. 4A. Spermatheca shaped as in Fig. 2H.

Measurements.—Pronotum length, 0.40–0.42; head length, 0.27–0.29; elytra length, 0.38–0.41. Number measured, 5.

Holotype.—1 male, no. 12657, Venezuela, Rancho Grande, September 2, 1967, Coll. Elizabeth McMahan and Wilbur. In the collection of the author to be eventually deposited in the collection of Field Museum of Natural History.

Paratypes.—6, same data as holotype (DK).

Notes.—The host termites were determined to be *Coptotermes testaceus* (Linnaeus) by A. E. Emerson. Specimens of the host termite are in the Emerson Collection of the American Museum of Natural History, New York, and in the collection of the author. One larval specimen was associated with the type series. A picture of this specimen is shown in Figure 5B. It is problematical whether this is the actual larva of this species, but by showing pictures of associated larva it may help to establish further correlations as more collections are made. The species is named for Dr. Elizabeth McMahan who collected it and made it available for study.

HOST RELATIONSHIPS

All of the species have proved to be host specific so far. A summary of the host relationships by host termite is provided in Table I.

If the termites have evolved proportionately to the evolution of the termitophiles, we should expect *Coptotermes crassus* to be more closely related to *C. niger* than either of these species are to *C. testaceus*.

TABLE I.—Summary of the host relationships of species of *Neophilotermes* arranged by termite host.

Termite Species	Termitophile
<i>Coptotermes crassus</i> Snyder	<i>Neophilotermes costaricensis</i>
<i>C. niger</i> Snyder	<i>N. dybasi</i>
<i>C. testaceus</i> (Linnaeus)	<i>N. mcmahanae</i>

Nothing is known about the behavior of these species but from the presence of the very large tergal defense gland reservoir in abdominal segment VI, I should expect them to be predators on the termites and not very well integrated into the social life of the colony.

The genus *Coptotermes* is known to have been invaded by staphylinid termitophiles at least three times. One of these was by the subtribe Coptotermoeiina, confined to Australia and revised by Kistner and Pasteels (1970), another by the subtribe Hetairotermitina, found in the Orient and Australia and revised by Kistner (1970), and by *Neophilotermes*. Two of these groups, the Hetairotermitina and *Neophilotermes*, never developed physogastry and neither of these groups are probably well integrated into the termite societies. *Hetairotermes* Cameron shows evidence of this in that at least three host changes have occurred, while *Neophilotermes* has such large defense gland reservoirs. On the other hand, the Coptotermoeiina have developed both physogastry in some genera and limuloid body shape in others and are probably well integrated into the social life of the colonies. This integration is probably effected in part (Kistner and Pasteels, 1970) by the modification of the defense gland and the development of gland cells in the pronotum and numerous gland cells in the hypodermis (type 3 gland cells). With three groups associated with *Coptotermes*, albeit in different parts of the world, it was natural to ask the question as to whether any of the three groups were directly related to one another. After careful comparison, it is my opinion that they represent three separate invasions. The tarsal formula and labium shape isolate *Hetairotermes*

from the other two groups. While the *Coptotermoeiina* and *Neophiloterme*s have the same 4-5-5 tarsal formula, the mouthparts are totally different as well as the structure of the meso- and metasternum.

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